

Can tubal reversal be an alternative to IVF? Cohort study

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ABSTRACT

Introduction: Tubal reversal is the surgery done after tubal sterilization. Mostly, sterilization at a younger age or a new partner makes women request tubal reanastomosis. In the literature, pregnancy and ectopic pregnancy rates after tubal reversal is about 65% and 5.6%, respectively.

Material and Method: In our study, data from the files of patients who had tubal reversal operations between 2015-2021 years in Şanlıurfa Training and Research Hospital were collected retrospectively. Demographic features, surgical and pregnancy outcome data of patients were collected. This study investigated the pregnancy rates and associated factors with pregnancy rates after tubal reanastomosis operations.

Results: In our study, 112 patients with tubal reversal operations were recorded. 25 out of 112 patients had spontaneous pregnancy after the tubal reversal operation. Age at a tubal reversal was a significantly important factor between a pregnant and non-pregnant group. According to age, below 40 years seems an ideal age factor for pregnancy. In our study, pregnancy rates were lower than in the literature.

Conclusion: Tubal reversal operation can be an alternative to IVF below 40 years of age.

Keywords: Pregnancy, sterilization, tubal reversal

INTRODUCTION

According to the authority of World Health Organization data, the percentage of tubal sterilization according to various countries changed and is 1% for Japan, 18.7% for the UK(1). Sterilization at a younger age, a relationship with a new partner, and lower socioeconomic status are the main reasons for tubal reversal requests.

Tubal reversal operations may be performed by laparotomy, laparoscopy, or robotic approach. However, there are patients who are considering direct IVF treatment if tubal reanastomosis fails or for fear of ectopic pregnancy. In the literature; reported pregnancy rates vary between 57% to 84%, and the associated risk for ectopic pregnancy is 2%–7% (2). IVF treatment is expensive as if the patient has health insurance, she will not pay for this surgery with tubal factor indication, but if there is no health insurance, the price of tubal reversal is about 500 dollars, while IVF treatment is around 2000 dollars, but the cost-effectiveness of tubal reversal surgery is controversial.

This study investigated the pregnancy rates and associated factors with pregnancy rates after tubal reanastomosis operations, and to determine at which patient can be

selected for tubal reanastomosis instead of IVF treatment by the success of the surgical procedure.

MATERIAL AND METHOD

The study was carried out with the permission of Harran University Clinical Researches Ethics Committee (Date: 07.06.2021, Decision No: HRU/21.11.13). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Data for the study is collected from the files of patients who had tubal reversal operations between 2015-2021 years in Şanlıurfa Training and Research Hospital, retrospectively. In addition, patients' demographic features and surgical and pregnancy outcome data were collected. Because of the standardization of the tubal ligation technique, only the Pomeroy technique during cesarean section were selected for the study. A detailed evaluation of the fertility potential of each woman who requested tubal reanastomosis was evaluated before tubal reversal operations. Semen analysis of partners of all patients was also assessed to exclude male factor infertility. Patients

with organic pathologies associated with female factor infertility, like myoma uteri, unexplained ovarian masses, adenomyosis, and endometriosis, have been excluded from the study. All tubal reversal operations have been performed laparoscopically.

Surgical Procedure

Under general anesthesia, the patient was prepared in the lithotomy position. A uterine manipulator was inserted for chromopertubation, a Verres needle was inserted from an infraumbilical incision, and pneumoperitoneum was created. After an adequate pneumoperitoneum for surgery, 12 mm trocar was inserted from the umbilical entrance after the output of the Verres needle. Two separate 5 mm trocars were inserted from the entrances from bilateral 2-3 cm medial incisions of anterior iliac spines. If necessary, an extra trocar was inserted from the midclavicular line, 2-3cm below the umbilicus level. A chromopertubation was created to see the ligated parts of tubes in detail, and residual tubal length was measured. The previously damaged parts of tubes were cut by laparoscopic scissors, and healthy tubal luminal tissues were expected to be seen in detail. A flexible 2 mm catheter (18G epidural catheter) was inserted from the fimbria and moved through the cornual side to perform a fixed tube sutured. For a proper alignment, reanastomosis was achieved by suturing four separate sutures at 6, 3, 9, and 12 o'clock positions by absorbable 5-0 monofilament sutures (**Figure 1**). The tubal length formed after tubal reanastomosis (between cornual side and fimbria) was measured with a sterile paper meter inserted through a 10-gauge trocar. Tubal patency of both tubas was evaluated by methylene blue injection (**Figure 2**). All the surgeries were performed by the same surgeon (Esercan A). In the first month after the operation, tubal patency control was performed with hysterosalpingography in all patients, and at least one tubal passage was considered successful in the process. All the patients were discharged from the hospital on the next day of surgery.



Figure 1. Proper alignment of reanastomosis was achieved by suturing separate sutures



Figure 2. Control of tubal patency by methylene blue injection (methylene blue flux on the fimbria)

Statistical Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS.22, IBM SPSS Statistics for Windows, Version 22.0, IBM Corp., Armonk, NY, USA). The -Kolmogorov-Smirnov test was used to verify the normality of the distribution. Mean, or median values were used to describe the data characteristics for normal distribution. Categorical data were presented as percentages. Chi-square, and Fisher's exact tests were used to analyze categorical data. The t-test was used to calculate two independent means, and the significance level for all tests was defined as $p < 0.05$.

RESULTS

Between 2015-2021 years, 160 women had tubal anastomosis operation. 112 women out of 160 women with available data met the inclusion criteria were included in the study. In the first month after the operation, tubal patency control was performed with hysterosalpingography in all patients, and at least one tubal passage was considered successful in the process. Tubal methylene blue flow was seen in both tubes in the surgery at the final but at postoperative period at least one tubal passage was considered enough so all of the patients were included for the pregnancy follow-up. The mean age of women at tubal ligation was 33.69 ± 0.51 (20-42) years. Mean gravida was 5 (3-10). The mean cesarean number at tubal ligation was 3 (1-5). The mean FSH test level at a tubal reversal was 8.21 ± 0.94 (1,82-15). The mean age at a tubal reversal was 36.5 ± 0.53 (22-46) years. The mean time between tubal ligation and reversal was 2.86 ± 0.16 (1-9) years. These data were given in **Table 1**. The operation time ranged from 90 to 160 minutes, and the mean operation time was 120 minutes. No postoperative surgical complication has been experienced.

Table 1. Means and standard deviations for study variables				
Studyvariables	Pregnant group (n=25)		Non-pregnant group(n=87)	
	M	SD	M	SD
Age at tubal ligation	31.48	0.97	34.37	0.57
Age at tubal reversal	34.08	1.05	37.19	0.60
FSH level	5.64	0.55	5.72	0.84
Number of cesareans	2.56	0.19	2.80	0.23
Gravida	5.4	0.27	5.2	0.61
Residual tubal length (cm)	5.6	0.34	5.2	0.45

25 out of 112 (22%) women had spontaneous pregnancies after tubal reversal operations. After tubal reversal operations, the meantime to have pregnancy after tubal reversal operations was 22.72 ± 3.16 (6-60) months. Of these pregnancies, one woman (1/22 pregnancy) had an ectopic pregnancy and could be treated successfully medically without the need for surgery.

In our study, according to age groups; pregnancy rates were 30%, 29%, and 2% in the 22-34 age, 35-39 age, and 40-46 age groups, respectively (**Figure 3**). There was no significant difference in FSH levels, cesarean number and gravida between pregnant and non-pregnant group. There was a significant difference and decline in pregnancy rates after tubal reversal after age 40 ($p < 0.05$).

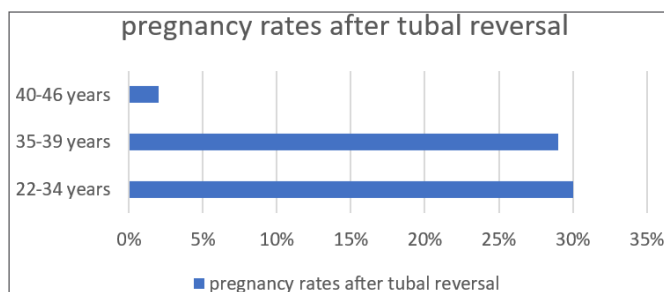


Figure 3. Pregnancy rates according to age groups after tubal reversal

DISCUSSION

No statistical difference was reported for tubal reversal by Elci et al. (3) between laparoscopy, laparotomy, and robotic surgery groups in terms of pregnancy rates; in their study, Gomel et al. (4) reported that; age at the time of tubal reversal was the most critical factor in the outcome of tubal reanastomosis. Women who were younger than 35 years of age at the time of reversal can anticipate an intrauterine pregnancy rate of greater than 70%. In these women, most pregnancies have occurred within the 18 months after surgery. Our study showed no difference between pregnancy and non-pregnancy groups according to residual tubal length ($p > 0.05$). However, some studies have reported that the residual tubal length is effective in the operation's success. The remaining total tubal length > 4 cm appears to be one of the positive prognostic factors of tubal reanastomosis

success. Because the total length of the fallopian tube is 11-12 cm, and 2/3 of the total length is the ampulla of the fallopian tube, this 4 cm definition seems to be associated with this. According to a systematic review of 15 studies, pregnancy rates after laparoscopic reversal ranges from 25% to 83%, with a pooled pregnancy rate of 65% (95%CI: 61%-74%). The mean pooled ectopic pregnancy rate was 5.6% (95%CI: 3%-9%)(5). In our study, according to age groups, in the 22-34 age group, 35-39 age group, and 40-46 age group, the pregnancy rate was 30%, 29%, and 2%, respectively. There was a significant difference and decline in pregnancy rates after age 40 ($p < 0.05$).

According to the American Society for Reproductive Medicine committee opinion in 2015, pregnancy rates are not suitable compared with IVF because success is defined as pregnancy rates per patient in surgery. In contrast, IVF success rates are defined per cycle. The tubal reversal has significantly higher cumulative pregnancy rates than IVF, and it has more advantages without considering complications of multiple pregnancies and ovarian hyperstimulation syndrome (6).

Same as our study results; Messinger et al. (7) reported that tubal reversal surgery is more cost-effective in patients younger than 41 years. At the same time, IVF is more cost-effective in patients older than age 41. Van De Water et al. (8) in 2015 published an excellent series of 88 patients in favor of laparoscopic reversal with a pregnancy rate of 73% for women < 40 years.

In the literature, 37 seems to be an essential criterion. According to Boeckstaens et al. (9) cumulative pregnancy rates are higher for tubal reversal in patients below 37 years old and higher for IVF in patients over 37, even though Godin et al. (10) did not reach a statistical difference.

Although, patients who had organic factors were excluded from the study; in our study, pregnancy rates were lower than in the literature. Our residual tubal length is about 5 centimeters it may cause lower pregnancy rates.

The one-stitch technique (at 12 o'clock), two-stitch technique (at 6 and 12 o'clock), three-stitch technique, and four-stitch technique (at 3, 6, 9, and 12 o'clock) were reported for tubal anastomosis. We used a single-layer surgical technique. To keep firm alignment and maintain blood flow, the four-stitch technique was considered the most reasonable method. In our opinion, too many or too few sutures would not be optimal, and we, therefore, used the four-stitch technique.

Our study has some limitations. First, this is a retrospective design, and the results may be affected due to retrospective design. Also, we have only included the patients who have undergone tubal sterilization by the

Pomeroy technique in the study. The patients that have undergone tubal sterilization by other techniques were omitted. However, the primary strength of our study is that all tubal reversal operations have been performed by the same physician that, excludes the surgical experience factor of the surgeon.

CONCLUSION

The most important factor of pregnancy success rate is age; especially less than 40 years old.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Harran University Clinical Researches Ethics Committee (Date: 07.06.2021, Decision No: HRU/21.11.13).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version.

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